

JET PROPULSION LABORATORY

INTEROFFICE MEMORANDUM

February 12, 2001

NL368-02-001

TO: E. Burke

FROM: N. Lacey

SUBJECT: 2001 Mars Odyssey Mission - DSN Tracking Requirements

REFERENCE: Detailed Mission Requirements (DMR) For 2001 Mars Odyssey, Final Draft.

The Resource Allocation Planning and Scheduling Office (RAPSO) has reviewed the request for DSN support as defined by the referenced document by the 2001 Mars Odyssey Project. RAPSO has performed any analysis to determine the excepted supportable time for the Mars Odyssey spacecraft and identified periods of high contention with other users of the DSN.

The Mars Odyssey project has requested both 70M and 34M tracking support. This table is representative of Table 3 in the referenced document:

2001 Mars Odyssey Mission:DSN Tracking Requirements

| <u>Mission Phase</u> | <u>From</u> | <u>To</u> | <u>Duration</u> | <u>DSN Resource</u> | <u>Tracking</u> |
|---------------------------------|------------------|------------------|-----------------|---------------------|-------------------|
| Launch & Post Launch | 07 Apr 01 | 14 Apr 01 | 7 days | 70m/34m | 2 pass/day |
| Early Cruise | 14 Apr 01 | 21 Apr 01 | 7 days | 34m | 1 pass/day |
| Cruise | 21 Apr 01 | 01 Jul 01 | 71 days | 34m | 3 pass/wk |
| TCM-2 Coverage | 01 Jul 01 | 11 Jul 01 | 10 days | 34m | 3 pass/day |
| Cruise | 11 Jul 01 | 04 Sep 01 | 55 days | 34m | 3 pass/wk |
| Mars Approach | 04 Sep 01 | 24 Oct 01 | 50 days | 34m | 3 pass/day |
| Encounter (MOI) | 24 Oct 01 | | | 70m | 1 pass |
| Orbit Insertion | 24 Oct 01 | 01 Nov 01 | 8 days | 70m/34m | 6 pass/day |
| Primary Aerobraking | 01 Nov 01 | 12 Dec 01 | 41 days | 34m | 3 pass/day |
| Extended Aerobraking | 12 Dec 01 | 20 Jan 02 | 39 days | 70m | 3 pass/day |
| Transition to Mapping | 20 Jan 02 | 27 Jan 02 | 7 days | 70m/34m | 6 pass/day |
| THEMIS 1 (Science) | 27 Jan 02 | 23 Dec 02 | 330 days | 70m | 2 pass/day |
| GRS | 23 Dec 02 | 29 Oct 03 | 310 days | 34m | 2 pass/day |
| THEMIS 11 (Science) | 29 Oct 03 | 01 Aug 04 | 277 days | 70m | 2 pass/day |
| Relay Mission | 01 Aug 04 | 01 Nov 05 | 457 days | 34m | 1 pass/day |
| Extended Relay Mission | 01 Nov 05 | 19 Sep 07 | 687 days | 34m | 1 pass/day |

Summary of Results

The 2001 Mars Odyssey mission (M01O) will often contend with several projects through the Extended Relay Mission phase, mainly other Mars missions, for atennna assets. However, Mars Odyssey projected supportable percentage of requested time on a weekly basis for the duration of

the mission is 80 to 90%. The weekly average is 85% except during the potential contention periods indicated below. The projected supportable percentage during the potential contention periods is 45 to 50%.

As always, the results of this evaluation are preliminary in that the network load changes as requirements for planned missions are input and updated. We will continue to work with Mars Odyssey and other users to maximize the time available the time available for each individual user.

o Downtime

The Deep Space Network (DSN) has thirteen scheduled downtimes periods, ranging from 8 to 11 weeks, required for 70M Servo Drive Upgrade, Antenna Controller Replacement and NSP Implementation. Two of the 70M downtimes are scheduled during the THEMIS 1 science campaign, DSS-14, 07/15/02 - 09/27/02 and DSS-43, 11/25/02 - 02/09/03.

There are also four additional unscheduled downtimes periods, ranging from 10 - 13 weeks each, required for Antenna Controller Replacement, during 2004 through 2006. These downtime periods need to be watched for changes in contentions as Mars Odyssey and other user's requirements are modified and refined.

o Potential Contention Periods

Three potential contention periods were identified during this analysis. **These potential contention periods violate a basic policy of TMOD/RAPSO that prohibit "hot backups" or dual antenna planning/scheduling.** There are exceptions to this rule where mission success is dependent on the communication to the spacecraft. For example, initial acquisition during launch or Mars Orbit Insertion are activities that warrant dual coverage. In December, RAPSO received an updated request that does not include dual support for the 8 days following orbit insertion and the 7 days during the transition to mapping.

The first potential contention occurs in early April, 2001. Dual continuous coverage, two 16-hour passes per day (70M/34M), is requested for launch plus 7 days from the Canberra, Australia complex. There are only three antennas capable of supporting this mission from Canberra after initial acquisition when the 26M antenna is used for aid in this activity. This contention was identified during the August, 2000 Resource Allocation Review Board meeting and resolved at the Mid-range Planning level. Several projects complained and lost valuable tracking data but M01O scheduled about 97% of the requested dual coverage. If the launch day moves into the launch period, dual coverage is not assured as other missions have previously sequenced their spacecraft for communication support.

The second potential contention occurs in late October, 2001 when dual continuous coverage, six passes per day (70M/34M) is requested for Orbit

Insertion, October 24 through November 1, 2001. M01O support is forecasted on the 70M subnet, three passes per day. Mars Global Surveyor, Stardust, Voyager 1 and Voyager 2 support is forecasted on the 34M HEF for their normal operations.

The third potential contention occurs in late January, 2002 when dual continuous coverage, six passes per day (70M/34M) is requested for “transition to mapping”, January 20, through January 27, 2002. M01O support is forecasted on the 70M subnet, three passes per day. Mars Global Surveyor, Stardust and Voyager 2 support is forecasted on the 34M HEF for their normal operations.

o Effect to Other Users during the Potential Contention Periods

October 24 through November 1, 2001

If M01O is forecasted on the 34M HEF along with the 70M, dual continuous coverage, during the Orbit Insertion Phase, the following missions may lose support hours as indicated: Mars Global Surveyor (103), Stardust (7), Voyager 1 (61) and Voyager 2 (61).

January 21 through January 27, 2002

If M01O is forecasted on the 34M HEF along with the 70M, dual continuous coverage, during the Transition to Mapping Phase, the following mission may lose support hours as indicated: Mars Global Surveyor (114) and Voyager 2 (25).